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Gwynns Falls Sewershed Evaluation Study Plan
Project 1032

Sewershed Study and Plan Report
Sanitary Sewer Overflow Consent Decree
Civil Action No. JFM-02-1524

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Executive Summary

On September 30, 2002, the City of Baltimore (City) entered into a Consent Decree with the United States Environmental Protection Agency (EPA), the State of Maryland Department of the Environment (MDE) and the Department of Justice (DOJ). The objective of Paragraph 9 of the Consent Decree is to complete a series of "Collection System Evaluation and Sewershed Plans". This Sewershed Study and Plan details the evaluation of the Gwynns Falls Sewershed.

Gwynns Falls is one of eight sewersheds located within the City. The sewershed study included the inspection or cataloguing of approximately 980,000 linear feet (lf) of gravity sewer ranging from 6- to 102-inches in diameter, approximately 5,200 public sector manholes, six sets of inverted siphons, the Westport Wastewater Pumping Station and 200-lf of associated existing force main, the Maidens Choice Pressure Sewer, and the Southwest Diversion Pressure Sewer.

Of the assets identified under the Gwynns Falls Sewershed, approximately 920,000-lf of gravity sewers and 5,100 of the public sector manholes are located within the sewershed. The remaining 60,000-lf of gravity sewers and 100 public sector manholes are located outside of the main Gwynns Falls sewershed in the Maidens Choice Pressure Sewer service area, the PA-13 basin, and the Southwest Diversion Pressure Sewer service area. These assets were included as part of the Gwynns Falls Sewershed Study, despite not being located within the sewershed boundaries, because they convey sanitary sewer flow exclusively from the Gwynns Falls sewershed to the Patapsco Wastewater Treatment Plant (WWTP).

Much of the sewershed's collection system was constructed in the 1920s and 1930s. The collection system is comprised of four conveyance sub-systems. These sub-systems can be identified as: Upper Gwynns Falls, Lower Gwynns Falls, Maidens Choice, and PA-13. Upper Gwynns Falls conveys flow from the northern part of the sewershed through the Forest Park, Powder Mill, and Walbrook interceptors into the main Gwynns Falls Interceptor. Lower Gwynns Falls conveys flow from the southern part of the sewershed through the Dead Run interceptor and other smaller tributaries into the main Gwynns Falls interceptor. Maidens Choice also conveys flow from the southern part of the sewershed through the Maidens Choice interceptor directly into the Southwest Diversion via the Maidens Choice Pressure Sewer or into the Low Level Sewershed through the Primson Avenue diversion chamber. Moreover, Maidens Choice conveys sanitary sewer flows generated by Baltimore County that enter the City boundary at the south west of the Gwynns Falls sewershed. PA-13 is a sub-basin within the Patapsco sewershed which is pumped to the Southwest Diversion by the Westport Pump Station.

The Gwynns Falls interceptor conveys the majority of the sanitary sewer flow in the sewershed, aside from that conveyed by the Maidens Choice interceptor to the Southwest Diversion. The Southwest Diversion, in turn, discharges to the Patapsco WWTP. This interceptor also conveys the sanitary sewer flow generated by the Baltimore County Gwynns Falls sewershed. Under normal operating conditions all the flow generated within the Gwynns Falls sewershed is discharged to the Patapsco WWTP; however, flow can be diverted to the High Level interceptor for treatment at the Back River WWTP via the Baltimore Street diversion structure or diverted to the Low Level sewershed via the Primson Avenue diversion chamber. It should be noted that during normal system operation, flows are not diverted to the Back River WWTP service area.

In accordance with the Consent Decree, the following items have been completed for the Gwynns Falls Sewershed Study and Plan:

- Evaluation of the effectiveness of the construction projects completed pursuant to Paragraph 8 of the Consent Decree using rainfall and flow monitoring data, as well as the hydraulic model developed in accordance with Paragraph 12 of the Consent Decree. Based on a comparison of pre- and post-flow monitoring data, there has been a significant volume reduction in Sanitary Sewer Overflows (SSOs) in the sewershed since the Paragraph 8 projects were completed.

- Presentation of the results of the rainfall and flow monitoring, as well as smoke and dyed water testing, conducted in the sewershed.

- Identification of deficiencies discovered during the collection system inspections, which included inspection of all gravity sewers having a diameter of eight inches or greater using closed circuit television (CCTV) inspection and inspection of all manholes and other appurtenances within the sewershed.

- Identification of rehabilitation and other corrective actions taken, or proposed to be taken, to address the deficiencies identified during the evaluation of the sewershed.

- Description of the decision-making criteria used to select future corrective action.

- Proposal of a plan and schedule for future evaluation of the collection system within the sewershed.

- Proposal of a plan and schedule for implementing rehabilitation and other corrective actions deemed necessary either to correct deficiencies identified during the collection system evaluation or to ensure operation of the collection system.

- Proposal of a plan and schedule for eliminating those identified physical connections between the sanitary sewer collection system and the storm water collection system.

- Determination of the range of storm events for which the collection system in its existing condition can convey peak flows without the occurrences of SSOs.

- Prediction of the range of storm events for which the collection system will be able to convey peak flows without the occurrence of SSOs assuming completion of the Paragraph 8 construction projects and completion of the proposed rehabilitation and other corrective action projects recommended in this Sewershed Plan

- Certification of the Geographic Information System (GIS) described in Paragraph 14 of the Consent Decree.

As required by the Consent Decree, the Sewershed Plan identifies specific improvements or other corrective actions needed to address structural deficiencies, reduce rainfall dependent inflow and infiltration (RDII) contributing to SSOs, address hydraulic deficiencies identified during the hydraulic analyses, and address other deficiencies that contribute to SSOs.

As part of the sewershed study, the City developed a condition and criticality protocol that provides the framework for a rehabilitation strategy based on criticality (consequences of failure) and condition (probability of failure) ratings of 1 through 5. Assets whose failures can impact the community or environment and whose condition is the poorest received a higher rating and will receive attention sooner. Assets that receive a lower rating will receive some level of regular monitoring but no immediate action or rehabilitation. Five levels of

prioritization were developed based on the combination of condition and criticality as shown in the matrix in Figure ES-1:

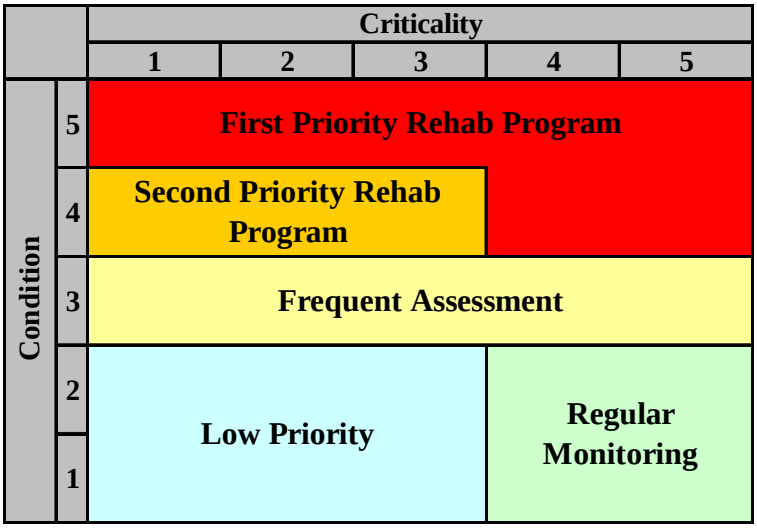

Figure ES-1: Condition and Criticality Matrix

Prioritization of asset rehabilitation projects and other corrective actions were developed with the consideration that all proposed improvements required to eliminate SSO's must be completed before January 1, 2016, as stipulated in the Consent Decree. The proposed improvements include the study of suspected SSO structures, rehabilitation of manholes and sanitary sewers that received a condition rating of 4 or 5, cleaning and rehabilitation of a siphon vault, further inspection of the Maidens Choice Pressure Sewer, and completion of the required hydraulic improvements. The proposed improvement projects and the estimated costs to complete these repairs are summarized in the following table:

Table ES-1: Proposed Improvement Projects Summary (cost in millions of 2008 dollars)

First and Second Priority Sewer Rehabilitation			
Rehabilitation Item	**Quantity**		**Est. Cost**
Manhole Rehabilitation/Replacement	73	Ea	$0.39
Cured-In-Place-Pipe Lining	15,533	LF	$1.14
Sewer Point Repair (10' Repair)	3,040	LF	$1.64
Sewer Replacement (> 10' Repair)	3,410	LF	$1.64
Sewer Point Repair & Cured-In-Place-Pipe Lining	1,032	LF	$0.16
Sewer Replacement & Cured-In-Place-Pipe Lining	2,054	LF	$0.20
Siphon Vault Rehabilitation and Cleaning	1	Ea	$0.19
Maidens Choice Pressure Sewer Inspection	1	Ea	$0.19
Sub-Total Estimated Cost:			$5.55
Hydraulic Improvements			
Rehabilitation Item	**Quantity**		**Est. Cost**
6" to 24" Cured-In-Place-Pipe Lining	100,199	LF	$7.34
12" to 36" Pipe Replacement	17,675	LF	$24.87
Manhole Sealing	28	Ea	$0.03
Manhole Rehabilitation/Replacement	603	Ea	$3.18
Equalization Tanks	2.45	MG	$20.87
Sub-Total Estimated Cost:			$56.30
Total Estimated Cost:			**$61.85**

Inspection data for those manholes and sewers that received condition rating of 1, 2, or 3 were reviewed to determine whether corrective actions were required. Those deficiencies that require corrective actions were recommended for inclusion in the First and Second Priority corrective action plan. These repairs include the rehabilitation or replacement of 73 manhole structures, installation of approximately 15,533-lf of cured-in-place-pipe (CIPP) liner, approximately 3,040-lf of point repairs, approximately 3,410-lf of sewer replacement and various quantities of point repair/CIPP and sewer replacement/CIPP combinations for deteriorated sewer located through the sewershed.

The recommended hydraulic improvements include miscellaneous 12 to 36-inch diameter sewer upgrades in the Powder Mill, Forrest Park, Dead Run, Maidens Choice, and Gwynns Falls sub-sewersheds. Two storage tanks are recommended for the Maidens Choice sub-sewershed totaling 2.45 million gallons. Miscellaneous manhole rehabilitation/replacement is also recommended for the Powder Mill, Forrest Park, Dead Run, Maidens Choice, and Gwynns Falls sub-sewersheds.

Baltimore County is currently developing hydraulic models for the contributing upstream County portions of the Gwynns Fall Sewershed. The combination of the City and County hydraulic models would result in a regional model capable of providing more realistic results and recommendations. This Plan provides recommended improvements that should be implemented by the City in accordance with the schedule provided. However, the Plan should not be considered final and may require amendment once the system-wide regional hydraulic model is completed and simulations are performed.

As required by Paragraph 9.C.xii of the Consent Decree, as well as under other contracts, the City will also implement continuous operation and maintenance enhancement efforts within the sewershed. These programs will be comprehensive, system-wide initiatives that will include a long-term flow monitoring plan, a sewer cleaning program, CCTV and manhole inspection programs, and root and grease control programs.